MikroTik™ V2.0 Router Software
Technical Reference Manual

Manual's Revision 2000-05-05

Mikrotikls SIA

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Preface

Document Organization

The document consists of 11 main parts. Parts can be divided further into sections. Each section (or a part if it doesn't consist of sections) of this document is divided into three subsections. In the first subsection management from the Java Console is described. Management from the Console is described in the second subsection. The third subsection is devoted to description of the parameters. However some sections are not divided if it is not necessary.

Document Conventions

In this publication, the following conventions are used:

▪ All console related settings: commands, arguments, parameters, examples and keywords are marked out with the `Courier New` font;

▪ The following conventions are used in the command syntax description:

- In the place where something is written in between of "<" and ">" you need to enter a value, e.g. `<address>`;

- Optional parameters are enclosed in brackets, e.g. `[interface <name>]`;

- The vertical line "`I`" means "OR";

1. Startup Guide

1-1 Before You Start

To make a PC based router running MikroTik™ Router Software, it is necessary to:

- Prepare the PC hardware to be dedicated router – no other programs can be held on the HDD or run on the PC except the MikroTik™ Router Software
- Prepare to obtain an installation archive from "Mikrotikls" SIA – the file is approximately 5.5MB
- Prepare four 3.5" 1.44 MB blank, formatted floppy disks. Make sure that they are not write – protected or damaged. Disks will be used to make four installation floppy disks from the installation archive for installing the PC router software.

After the preparations have been done

- Download the installation archive from www.mikrotik.com. The standard MikroTik™ Router Software installation is distributed as self – extracting archive.
- Run the archive file on a Win95/98/NT computer, and press the 'Setup' button to automatically launch the "MikroTik™ Disk Maker". Follow the screen instructions to create four installation floppy disks. Insert the disks in the FDD as prompted. Put a label on each disk to avoid later confusion. When the "MT Disk Maker" ends its work, you will have a set of MikroTik™ Router Software installation disks ready.
- Install the MikroTik™ Router Software using the four installation floppy disks as described below.
- Obtain the license for your installation of the MikroTik™ Router Software.

1-2 Hardware Requirements and BIOS Settings

The MikroTik™ Router Software installs on a standard PC system with a hard disk or flash disk. Hardware requirements are as follows:

Processor – DX486 or higher CPU with math co-proccessor. Pentium (AMD, Cyrix, IDT WinChip or Intel) 100 or higher suggested;
RAM – at least 16 MB;
Video – Color or Monochrome VGA video card or on-board VGA port;
HDD controller – IDE hard drive controller;
HDD – Hard disk or flash disk (20 MB or more);
FDD – 1,44 MB Floppy Drive. This is not needed after installation, and can be safely removed;
Keyboard – may be also removed after the software installation, if BIOS allows the PC to boot without a keyboard.

<u>Monitor</u> – may be removed after installation. You should keep the keyboard and monitor attached if you want to administer the system locally from the console.

<u>Network Interface</u> – NE2000 or compatible NIC. For more supported network cards and devices, please see 'Supported Hardware' section.

Check the BIOS settings of your router. Make sure that the boot sequence is 'A: C:', and 'Floppy drive seek at boot' is enabled.

Check that the BIOS settings for PNP OS are disabled and PCI and ISA allocation of IRQs correspond to your interface installation plans. Disable the paralell port to free resources. Check the IO and IRQ assignments for Serial Interfaces, which should be as follows:

COM1 – IO 0x3f8 and IRQ 4
COM2 – IO 0x2f8 and IRQ 3

If you use 20MB SanDisk 3.5" FlashDrive as the target HDD for your router installation, use the recommended BIOS settings for it:

Cylinders 612, Heads 2, Sectors 32, Mode NORMAL

1-3 Installing the software

Put 'Disk #1' in the floppy drive, and boot up your router. The installation will be looking for hard drives. You will see something like this:

```
Found harddrive on IDE primary master (disk C)
To install software properly, it needs to be reformatted.

Format it? [y/n]:
```

Press yes to format you HDD.

Note *that the primary hard disk of your router will be overwritten, and any existing data on it will be destroyed.*

You will be asked to insert all next three installation floppies:

```
Please insert 2nd installation floppy.
Press ENTER when ready
```

and so on until the last floppy drive will be inserted and you will be asked to reboot your computer:
```
Software installed.
Press ENTER to reboot
```

Remove the installation disk from the floppy disk drive and press ENTER.

While booting up the router for the first time you will see your software ID, and you will be asked to enter your software key. This key is unique depending on several variables including the particular data carrier (flash disk or hard drive) and information from your MikroTik registered account. Please enter the software key obtained from MikroTik – www.mikrotik.com.

The software installation is complete.

Log on to your PC router running MikroTik™ Router Software for the first time using login name 'root' and password 'root'. Please change the root's password later for security reasons to avoid unauthorized access to your router.
NOTE: There is no way to replace a lost password, so be careful!

1-4 Configuring the Router

A connection via console port is established using an RS-232 null modem cable. Standard PCs have a 9 pin male serial port built-in. Use any VT100 terminal emulation program on your PC or Laptop. The required communication settings are:

```
9600 bps, 8 bit, No parity, 1 stop bit
```

For PC with Windows running, set the COM port to your corresponding serial port. Usually it is COM2.

After logging on to your PC router, you should go to the " `interface`" submenu to see the installed interfaces. Use the following command for that:

```
interface> print
```

If the device driver for the installed network interface card is loaded automatically (for example, most PCI NIC's), the interface should already be listed. Select the desired interface and type and enable it:

```
interface>set up <interface name>
```

If the device driver could not be loaded automatically, load the driver for the installed NIC using the "`driver`" submenu. Use the `load` command and supply the required parameters. For example, a NE2000 ISA card configured to use IO 0x300 and IRQ 5 requires following line to be entered:

```
driver>load name ne2k-isa io 0x300
```

Do not forget to enable the interface from the " `interface`" submenu as described above!

Go to the "`ip address`" submenu to assign an IP address to the router, for example:

```
ip  address>add  local  192.168.0.2  mask  255.255.255.224
interface ether1
```

(If not supplied, the network prefix 192.168.0.0 and broadcast address 192.168.0.31 will be calculated automatically in this case.)

Last thing to configure, before the router can be accessed remotely, is default gateway. Go to the 'Routes' menu and enter

```
ip route>add gateway 192.168.0.1 interface ether1
```

This will add the default route, i.e., to the destination 0.0.0.0 with network mask 0.0.0.0, using host 192.168.0.1 as a gateway, which can be reached using interface ether1.

Try to ping some host on your network to test the initial configuration, for example:

```
ip route>/ping 192.168.0.1
```

If you get responses from the host, your network connection works properly, and
you should be able to access the router remotely via network.

Please read appropriate sections of this manual for more detailed description of configuration options.

2 User Interconnection Description

2.1 Java Interconnection Description

MikroTik Java Console requires Java 2 browser plug-in.

In the Web Browser open the page with the address http://<IPAddressOfTheRouter>. Then start the applet.

2.1-1 General Information

When you type your login name and password you are logged in the router via Java Console.

All operations are performed via the main menu that is situated on the left of the main window. It consists of ten items. If menu item has an arrow sign than it contains submenu. Each of them is described in the User Manual in the corresponding chapter, excluding "Help". The table below describes the correlation.

Menu item	Chapter Name
Interfaces	Network Interface Management
IP	Internet Protocol Management
Routing	Advanced Routing Management
Queues	Queues Management
Bridge	Bridge Configuration
Drivers	Device Driver Management
SNMP	SNMP Service Configuration
System	System Configuration
Tools	Tools
Password	System Configuration

2.1-2 How To

Here are the most common actions that you perform on the entries:

Action	Description
Open	To open the required window simply click on the corresponding menu item.
Add	To add a new entry you should click on the "+" icon in the corresponding window.
Remove	To remove an existing entry click on the "-" icon.
Edit	There can edit an existing entry in two ways. The first one is to click twice on the icon on the left of each line. Then in the appeared window you can edit the required parameters. Click

	"OK" to accept changes or "Cancel" to discard them. The other way is to edit entry parameters directly in the mail window where all the entries are displayed. To accept your changes click on the appeared "Star Sign" in the right column and choose "Accept". If you want to discard the changes that has been made choose "Cancel".
Refresh	Click on the "Refresh" icon in the corresponding window.
Undo	Click on the "Undo" icon above the main menu.
Redo	Click on the "Redo" icon above the main menu.
Logout	Click on the "Logout" icon above the main menu.

Main Menu

Logout and login as another user

Undo last action

Traffic indicator

Logout and close the window

Redo last undone action

Submenu

Status Bar
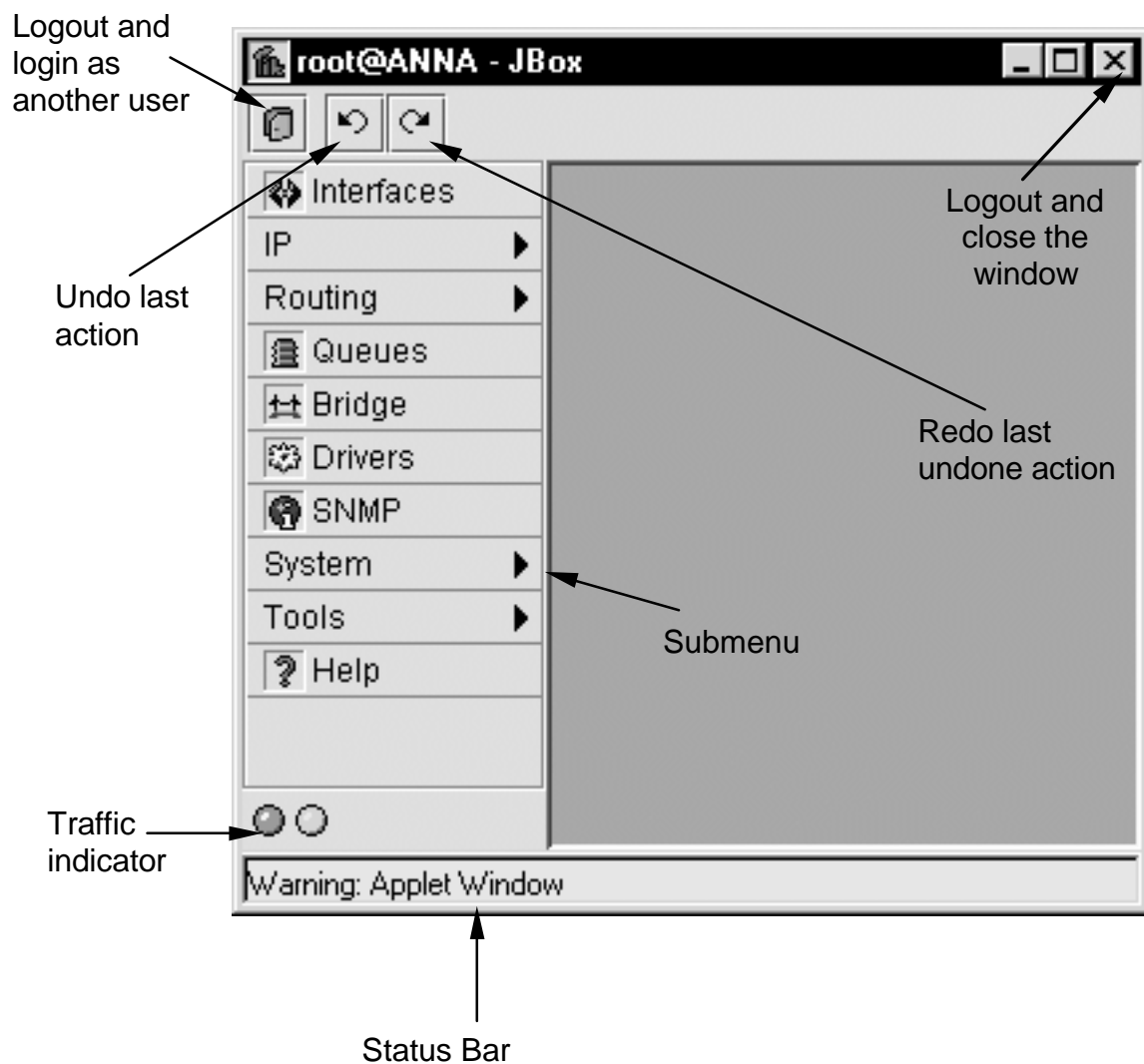
Editing an Entry

If you have edited entry parameters directly in the list box then you have to accept or discard your changes by clicking on the appeared star sign.
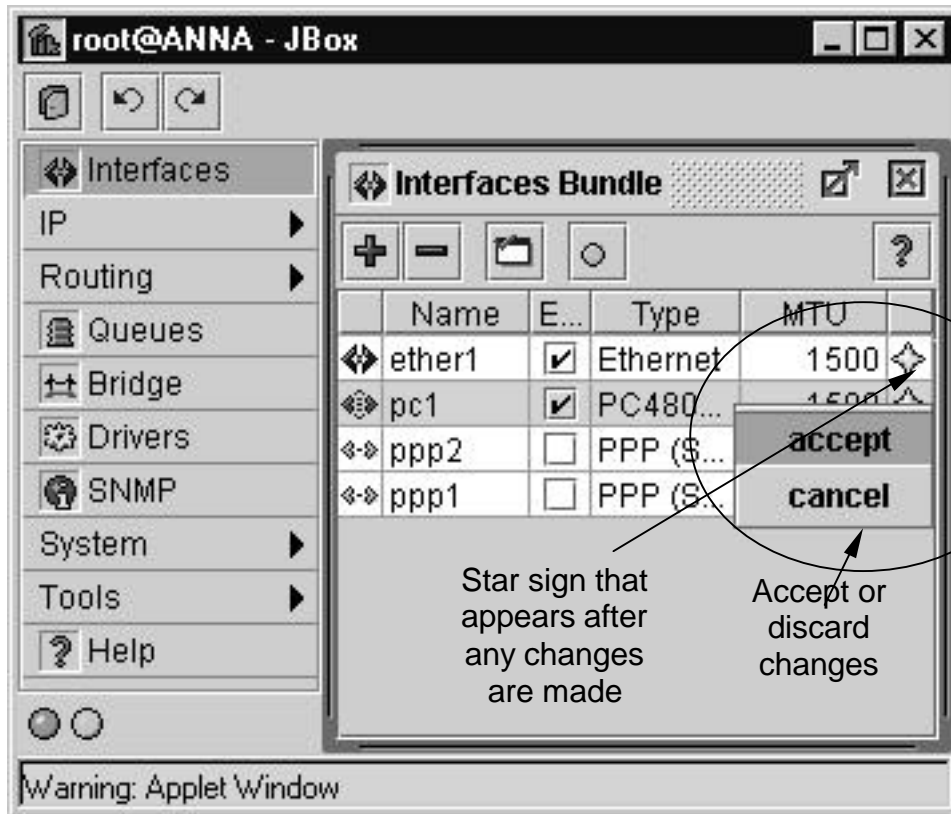
2.2 Console Interconnection Description

When you log in the router via console or telnet you get in the base level. As it is in Java almost every command has the corresponding chapter in the Manual. In the table below base level commands are described:

Command Name	Description	Chapter in the Manual
ping	Send ICMP Echo packets	Tools
floodping	Launch Flood Ping utility	Tools
import	Run exported configuration script	
telnet	Run Telnet	
quit	Quit Console	
setup	Do basic setup of the system	Terminal Setup and Basic System Setup
password	Change user password	System Configuration
undo	Undo previous action	
redo	Redo previously undone action	
export	Export the router configuration	
traceroute	Trace route to host	Tools

`btest`	Run bandwidth test to remote host	Tools
`interface/`	Interface configuration	Network Interface Management
`driver/`	Driver management	Device Driver Management
`sys/`		System Configuration
`bridge/`		Bridge Configuration
`snmp/`	SNMP configuration	SMNP Service Configuration
`terminal/`	Set terminal type	Terminal Setup and Basic System Setup
`ip/`	IPv4 specific settings	Internet Protocol Management
`routing/`	Routing protocol settings	Advanced Routing Management

The slash in the end of the command means that this command leads to the submenu.

2.2-1 How To

The table below describes how you can execute commands, move through the levels in the console, etc.

Command	Action
`command [Enter]`	Execute the command
`[?]`	Show the list of all available commands
`command [?]`	Display help on the command and the list of arguments
`command argument [?]`	Display help on the command's a
`[Tab]`	Complete the command/word. If the input is ambiguous, a second [Tab] gives possible options
`/`	Move up to the base level
`/command`	Execute the base level command
`..`	Move up one level
`""`	Enter an empty string
`"word1 word2"`	Enter space between words

You can abbreviate names of levels, commands and arguments.

2.2-2 Import and Export

There is a possibility to export/import router configuration to/from the files, i.e. to create a new file or to add chosen configuration to an existing file either to import configuration from a file to the router. These files are stored in the ftp access area of the router. That is where you can get by connecting to the router via ftp using login and password of the user `root`.

Command export has the following parameters:

Parameter Name	Description
`<filename>`	Export configuration to the file with this name
`append`	Append configuration to a specified file

Command `import` has only one parameter:

Parameter Name	Description
`<filename>`	Import router configuration from a specified file. File is taken from router ftp access area

Command `export` can be found in every level of the command tree. By executing it you can export the configuration of a specified level. For example if you execute this command in "`ip address`" level you will get the information about IP addresses settings. But if you execute it in " `ip`" level you will get the information about all IP settings: NAT, Firewall, DHCP, etc.

To view the configuration as it will look like in the export file simply enter the command `export` without any parameter.

For example you want to make a file that consists of Firewall settings and NAT settings. The file name is `test`. Then you have to execute the following commands:

```
[MikroTik]> ip firewall export test
[MikroTik]> ip nat export test append
```

The file can be accessed now by ftp (only user `root` can do that). Also these configurations are ready to be imported any time:

```
[MikroTik]> import test
```

3 Device Driver Management

Device drivers represent the software interface part of installed network devices. For example, the **MikroTik** system includes device drivers for NE2000 compatible Ethernet cards and other network devices. If you need a device driver for a device, which is not on the list, please suggest it at our suggestion page on our website.

Most device drivers are loaded automatically. For instructions on specific device drivers see the chart below.

Unloading of device driver is useful when changing network devices – this can be useful in avoiding loading drivers for devices, which have been removed from the system. This may be done automatically by removing the card and rebooting before inserting the new network device. The device drivers can be removed only if the appropriate interface has been disabled first.

3-1 Managing Device Drivers from Java

Select the "Drivers" menu to display the currently installed drivers. New drivers can be installed by selecting the "+". Existing drivers can be removed by selecting the "-" as long as their status is 'disabled' (set in the Interface menu). PCI drivers cannot be removed.

3-2 Managing Device Drivers from Console

Driver management commands are located in the "`driver`" menu.

Command syntax	Description

`load <driver name> [irq <IRQ>]`
`[io <IO range start>]`
`[mem <shared memory>]`
	Load driver

`unload <number>`	Unload driver
`print`	Show loaded drivers

Where `<number>` is number of a loaded driver, which can be viewed in the list, generated by the "`print`" command.

3-3 Device Driver Parameters

Name in console	Name in JAVA	Description
`name`	Driver	Name of driver to install*
`irq`	IRQ	Interrupt Request Number. Can be omitted if device does not use IRQ. For IRQ probing enter 0 in Java Box.

io	IO	Input/Output port range base address. Can be omitted if device does not use IO ports. If you want to enter I/O port range base address in hexadecimal form, you should put "`0x`" before it, e.g. `0x300`
mem	MEM	Shared Memory base address. Can be omitted if device does not use Shared Memory.

*- In console use abbreviated form of driver name, available from help.

3-4 Supported interfaces

PCI Cards

Driver name: ne2k-pci

Interfaces:
RealTek RTL-8029
Winbond 89C940
Compex RL2000
KTI ET32P2
NetVin NV5000SC
Via 86C926
SureCom NE34
Winbond
Holtek HT80232
Holtek HT80229

Driver name: 3c95x (3Com 3c590/3c900 series Vortex/Boomerang driver)

This device driver is designed for the 3Com FastEtherLink and FastEtherLink XL, 3Com's PCI to 10/100baseT adapters. It also works with the 10Mbs versions of the FastEtherLink cards. The supported product IDs are shown in the following table:

Interfaces:
3c590, 3c592, 3c595, 3c597, 3c900, 3c905
3c590 Vortex 10Mbps
3c595 Vortex 100baseTx
3c595 Vortex 100baseT4
3c595 Vortex 100base-MII
3Com Vortex
3c900 Boomerang 10baseT
3c900 Boomerang 10Mbps Combo
3c900 Cyclone 10Mbps Combo
3c900B-FL Cyclone 10base-FL
3c905 Boomerang 100baseTx
3c905 Boomerang 100baseT4

3c905B Cyclone 100baseTx
3c905B Cyclone 10/100/BNC
3c905B-FX Cyclone 100baseFx
3c905C Tornado
3c980 Cyclone
3cSOHO100-TX Hurricane
3c555 Laptop Hurricane
3c575 Boomerang CardBus
3CCFE575 Cyclone CardBus
3CCFE656 Cyclone CardBus
3c575 series CardBus (unknown version)
3Com Boomerang (unknown version)

Driver name: lmc

Interfaces: LanMedia LMC5200
LanMedia LMC5245
LanMedia LMC1000

Driver name: eepro100 (Intel i82557/i82558 PCI EtherExpressPro driver)

This device driver is designed for the Intel i82557 "Speedo3" chip, Intel's single-chip fast Ethernet controller for PCI, as used on the IntelEtherExpressPro 100 adapter.

Driver name: tulip

This device driver is designed for the DECchip "Tulip", Digital's single-chip ethernet controllers for PCI. Supported members of the family are the 21040, 21041, 21140, 21140A, 21142, and 21143. Similar work-alike chips from Lite-On, Macronics, ASIX, Compex and other listed below are also supported.

Interfaces: Digital DC21040 Tulip
Digital DC21041 Tulip
Digital DS21140 Tulip
Digital DS21143 Tulip
Lite-On 82c168 PNIC
Macronix 98713 PMAC
Macronix 98715 PMAC
Macronix 98725 PMAC
ASIX AX88140
Lite-On LC82C115 PNIC-II
ADMtek AN981 Comet
Compex RL100-TX
Intel 21145 Tulip
Xircom Tulip clone

Driver name: rtl8139

This device driver is designed for the RealTek RTL8129, the RealTek Fast Ethernet controllers for PCI. This chip is used on a few clone boards.

Interfaces: RealTek RTL8129 Fast Ethernet
RealTek RTL8139 Fast Ethernet
SMC1211TX EZCard 10/100 (RealTek RTL8139)
Accton MPX5030 (RealTek RTL8139)

Driver name: winbond-840

This driver is for the Winbond w89c840 chip.

Interfaces: Winbond W89c840
Compex RL100-ATX

ISA Cards

Driver name: ne2k-pci

Interface: NE2000

4 Network Interface Management

4.1 Introduction

An Interface is physical or virtual device which provides a connection to an external network. Network interfaces are created automatically when the Network Interface Card driver is loaded. Virtual (software) interfaces can be created manually.

4.1-1 Managing Network Interfaces from Java

Select the "Interfaces" menu to open the interface list window. The interfaces list displays basic interface parameters. Interface type specific parameters can be changed from interface details windows (opened by double clicking on icon to the left from interface name). The Interface details window has a standard "Traffic" tab which displays traffic that enters and leaves router through the interface. It can also contain other tabs with interface type specific parameters.

The Interfaces list window also contains a "blink" button. Selecting this button causes traffic to be generated on the highlighted interface and therefore blink the LEDs (**l**ight **e**mitting **d**iodes) on the card so that an administrator can determine which Interface name corresponds to the actual interface (when there are multiple interfaces of the same type). Note that not all interfaces support this function.

4.1-2 Managing Network Interfaces from Console

Network interface commands and submenus are located in "`interface`" menu. It contains several commands that are common to all interfaces:

Command syntax	Description
`print`	Show interface summary
`set <interface> [up] [down]` `[name <new name>] [mtu <MTU>]`	Change basic interface properties
`traffic <interface>`	Monitor traffic on interface

Where `<interface>` is interface name or number obtained from "`print`" command.

The "`interface`" menu also contains device type specific submenus with device type specific commands. The following device type submenus can be available, depending on what features are licensed for a particular installation:

Submenu	Description
ether	Ethernet interfaces
lmc	LMC Sync interfaces
ppp	Async PPP interfaces
ipsec	IPSec tunnels
radiolan	RadioLAN interfaces
arlan	Arlan IC2200 interfaces
sync	Moxa Sync interfaces
pc	Aironet 35/45/4800 interfaces
wavelan	WaveLAN interfaces

4.1-3 Basic Interface Parameter Description

Name in console	Name in Java	Description
name	Name	Human friendly name for the interface. Maximum 31 character.
up	Enabled (yes)	Enable interface
down	Enabled (no)	Disable interface
mtu	MTU	Maximum Transfer Unit (in bytes)
	Enabled	Enable or disable interface

4.2 Ethernet Interfaces

Ethernet interfaces include standard 10/100 Mbit Ethernet network interface. Ethernet interfaces do not have any device type dependent parameters. Each Ethernet interface has its MAC-address (Media Access Control).

4.2-1 Managing Ethernet Interfaces from Java

Ethernet interface parameters can be changed from interface list window or from interface details window "General" tab.

4.2-2 Managing Ethernet Interfaces from Console

Ethernet interface management is done in submenu " interface ether".

Command syntax	Description
print [<interface>]	Show interface(s) information
set <interface> [up] [down] [name <new name>] [mtu <MTU>]	Change interface properties
blink <interface>	Generate traffic to blink LEDs

Where <interface> is interface name or number obtained from "print" command.

4.3 Arlan IC2200 Interfaces

Arlan IC2200 interfaces include Aironet's Arlan IC2200 (655) 2.4GHz 2Mbps ISA Client Cards.

4.3-1 Managing Arlan IC2200 Interfaces from Java

Arlan IC2200 specific parameters can be controlled from the "Radio" tab in interface details window. Current status (registration status and registered router and backbone) can be monitored in real time on "Status" tab in interface details window.

4.3-2 Managing Arlan IC2200 Interfaces from Console

Arlan IC2200 interface management is done in the submenu "`interface arlan`".

Command syntax	Description
`print [<interface>]`	Show interface(s) information

`set <interface> [up] [down]`
`[name <new name>] [mtu <MTU>]`
`[frequency <channel frequency>]`
`[bitrate <bitrate>]`
`[cardname <card name>]`
`[arlan <yes|no>] [sid <SID>]`
	Change interface properties

`monitor <interface>`	Monitor interface status in real time
`blink <interface>`	Generate traffic to blink LEDs

Where `<interface>` is interface name or number obtained from "`print`" command.

Interface status includes registration status and registered router and backbone.

4.3-3 Arlan IC2200 Parameter Description

Name in console	Name in Java	Description
`frequency`	Frequency	Channel frequency in MHz.
`bitrate`	Bitrate	Data Transmission speed in Mbits
`cardname`	Card Name	Name of the client to be shown in the registration table of the Access Point or

		Bridge. Maximum 15 characters.
sid	SID	Value of System Identifier. Should be the same for all nodes on the radio network. Maximum 31 character.
arlan	TMA mode	Enable/Disable registration mode when client has to register to an AP2000 Access Point or BR2000-E Bridge.

4.4 LMC Sync Interfaces

LMC Sync interfaces include LMC5200 (HSSI), LMC5245 (DS3) and LMC1000 (V.53) cards.

4.4-1 Managing LMC Sync Interfaces from Java

LMC interface specific parameters can be controlled from the "Advanced" tab in the interface details window. Current status (status of card LEDs and current clock speed) can be monitored in real time on "Status" tab in interface details window.

4.4-2 Managing LMC Sync Interfaces from Console

LMC Sync interface management is done in submenu "interface lmc". It contains commands:

Command syntax	Description
print [<interface>]	Show interface(s) information
set <interface> [up] [down] [name <new name>] [mtu <MTU>] [extclk <yes|no>] [scrambler <yes|no>] [longcable <yes|no>]	Change interface properties
monitor <interface>	Monitor interface status in real time

Where <interface> is interface name or number obtained from "print" command.

Interface status includes status of card LEDs and current clock speed.

4.4-3 LMC Sync Interface Parameter Description

Name in console	Name in Java	Description
extclk	External Clock	Enable/Disable use of external clock
scrambler	DS3 Scrambler	Enable/Disable DS3 Scrambler

`longcable`	Long DS3 Cable	Enable/Disable long DS3 cable

4.5 PPP Interfaces

PPP (or Point-to-Point Protocol) provides a method for transmitting datagrams over serial point-to-point links. The 'com1' and 'com2' ports from standard PC hardware configurations will appear as 'serial0' and 'serial1' automatically. It is possible to add thirty-two additional serial ports with the Moxa C168 PCI multiport asynchronous card (eight ports each) to use the router for a modem pool.

4.5-1 Managing PPP Interfaces from Java

PPP interface specific parameters can be controlled from the "PPP" tab in the interface details window. Depending on line operation mode (dial-in, dial-out, or direct) additional parameters can be controlled from the "In" (for dial-in mode) or "Out" (for dial-out mode) tab. Current status (current line status, error description, uptime, and name of logged in user) can be monitored in real time under the "Status" tab in interface details window.

Note: The standard serial ports have a default configuration as serial "`console`" ports – see the 'Pameters' section for details.

4.5-2 Managing PPP Interfaces from Console

PPP interface management is done in the submenu "`interface ppp`".

Command syntax	Description
`print [<interface>]`	Show interface(s) information

`set <interface> [up] [down]`
`[name <new name>] [mtu <MTU>]`
`[mru <MRU>]`
`[type <dial-in|dial-out| direct>]`
`[auth <none|pap|chap>]`
`[user <username>]`
`[server <servername>]`
`[line <linespeed>]`
`[phone <phonenumber>] [tone <on|off>]`
`[rings <rings>] [nullmodem <on|off>]`
`[demand <on|off>] [idle <idletime>]`
`[init <string>]`
`[defaultroute no|off|on|yes]`
	Change interface properties

`monitor <interface>`	Monitor interface status in real time

Where `<interface>` is interface name or number obtained from "`print`" command.

Interface status includes current line status, error description (if any), uptime and name of logged in user.

4.5-3 PPP Interface Parameters

Name in console	Name in Java	Description
mru	MRU	Maximum Size of received packets
type	(type selection)	Line operation mode. Default value is `Dial-In`
auth	Authentication	Authentication type for this port
user	User Name	User name to use to log into server when dialing out. Can contain letters, digits, "*" and "_"
server	Server Name	Server name of this port for dial-in. Can contain letters, digits, "*" and "_"
line	Line Speed	Speed of serial line
phone	Phone Number	Phone number to call when dialing out
tone	Tone Dial	Enable/Disable tone dial
rings	Rings	Number of rings to wait before answering phone
nullmodem	Null Modem	Enable/Disable null-modem mode (when enabled, no modem initialization strings are sent). Default value is " on". So by default null-modem is turned on.
demand	Dial On Demand	Enable/Disable dial on demand
idle	Idle Time	Idle time after which close connection
init	Modem Init	Modem Initialization String
defaultroute	Add Default Route	Add PPP remote address as a default route. Other settings are: destination=0.0.0.0 netmask=0.0.0.0 interface=ppp, preferred source=0.0.0.0

4.6 IPSec Tunnels

IPSec tunnels are virtual interfaces that encrypt all traffic that is sent over them and forwards them as IP packets to tunnel endpoint. IPSec tunnels can be created and removed manually. A router can have total of 16 IPSec tunnels.

4.6-1 Managing IPSec Tunnels from Java

IPSec specific parameters can be controlled from the "IPsec" tab in interface details window. New IPSec tunnels can be created by selecting the "Add" button in interface list window. IPSec interfaces can be removed by selecting the "Remove" [-] button in interface list window.

4.6-2 Managing IPSec Tunnels from Console

IPSec tunnel management is done in the submenu "`interface ipsec`".

Command syntax	Description
`print [<interface>]`	Show interface(s) information
`add <interface> [up] [down]` `[name <new name>] [mtu <MTU>]` `remote <remote IP> spibase <spibase>` `mode <MD5-3DES|MD5-DES> ahkey <ahkey>` `espkey <espkey> [myside <left|right>]`	Add IPSec tunnel
`set <interface> [up] [down]` `[name <new name>] [mtu <MTU>]` `[remote <remote IP>]` `[spibase <spibase>]` `[mode <MD5-3DES|MD5-DES>]` `[ahkey <ahkey>] [espkey <espkey>]` `[myside <left|right>]`	Change interface properties
`monitor <interface>`	Monitor interface status in real time
`remove <interface>`	Remove IPSec tunnel

Where `<interface>` is interface name or number obtained from "`print`" command.

Interface status includes registration status and registered router and backbone.

4.6-3 IPSec Tunnel Parameters

Name in console	Name in Java	Description
`remote`	Remote Address	IP address of remote endpoint of tunnel
`spibase`	SPI Base	SPI Base
`mode`	Encryption mode	Encryption mode to use to encrypt packets
`ahkey`	AH Key	Authentication Header Key
`espkey`	ESP Key	ESP Key
`myside`	Side	Side of tunnel. Must be different for each end of tunnel.

4.7 RadioLAN Interfaces

RadioLAN interface supports the RadioLAN ISA CardLINK – Model 101 10Mbit radio card.

4.7-1 Managing RadioLAN Interfaces from Java

RadioLAN specific parameters can be controlled from the "Radio" tab in interface details window. Current status (current default destination) can be monitored in real time on "Status" tab in interface details window.

RadioLAN interfaces have an additional capability of low level radio connection testing. Test can be started and results monitored in real time on under the "Ping" tab.

4.7-2 Managing RadioLAN Interfaces from Console

RadioLAN interface management is done in submenu "`interface radiolan`".

Command syntax	Description
`print [<interface>]`	Show interface(s) information
`set <interface> [up] [down]` `[name <new name>] [mtu <MTU>]` `[distance <distance>]` `[txdiv <on|off>][rxdiv <on|off>][mode <alone|ap|cfg|firstap|firstclient>]` `[maxretr <maxretries>] [sid <SID>]` `[clientname <clientname>]` `[cfgdst <destination>]`	Change interface properties
`monitor <interface>`	Monitor interface status in real time
`table <interface>`	Show neighbor table
`test <interface>` `address <MAC address>` `[total <total>] [size <size>]`	Test link to remote RadioLAN host
`blink <interface>`	Generate traffic to blink LEDs

Where `<interface>` is an interface name or number obtained from "`print`" command. Interface status includes current default destination.

4.7-3 RadioLAN Interface Parameters

Name in console	Name in Java	Description
distance	Distance	Distance to remote end of point to point link
txdiv	Tx Diversity	Enable/Disable transmit diversity
rxdiv	Rx Diversity	Enable/Disable receive diversity
mode	Default destination	Operation mode
maxretr	Maximum Retries	Maximum retries to use when sending
sid	SID	System Identifier (4 chars max)
clientname	Name	Client name string. 15 characters maximum.
cfgdst	(Default destination string)	Configured destination. Used only in operation mode when default destination is configured.

Test utility parameters:

Name in console	Name in Java	Description
address	Ping To	MAC address of host to test link to
total	Packets	Total number of packets to use in test
size	Packet Size	Size of test packets

4.8 Moxa Sync Interfaces

Moxa Sync interfaces supports the Moxa C101 Sync adapters.

4.8-1 Managing Moxa Sync Interfaces from Java

Moxa Sync specific parameters can be controlled from "Synchronous" tab in interface details window. Current status (status of modem control lines, time since last keepalive and sequence number difference) can be monitored in real time under the "Status" tab in interface details window.

4.8-2 Managing Moxa Sync Interfaces from Console

Moxa Sync interface management is done in submenu " interface sync".

Command syntax	Description
print [<interface>]	Show interface(s) information
set <interface> [up] [down] [name <new name>] [mtu <MTU>] [keepalive <keepalive>] [speed <speed>]	Change interface properties

`[rxclock <internal|line>]`
`[txclock <internal|line|rxc>]`
`[nullmodem <on|off>]`	

`monitor <interface>`	Monitor interface status in real time
`blink <interface>`	Generate traffic to blink LEDs

Where `<interface>` is an interface name or number obtained from "`print`" command.

Interface status includes status of modem control lines (DTR, RTS, CTS, DSR, DCD), time since last keepalive, and sequence number difference.

4.8-3 Moxa Sync Interface Parameters

Name in console	Name in Java	Description
`keepalive`	Keepalive	Interval after which keepalive is sent (in seconds)
`speed`	Speed	Speed of internal clock
`rxclock`	Rx Clock Source	Receive clock source
`txclock`	Tx Clock Source	Transmit clock source
`nullmodem`	Null Modem	Enable/Disable null-modem mode (ignore DCD signal)

4.9 Aironet 35/45/4800 Interfaces

Aironet 35/45/4800 interfaces include Aironet 3500, 4500, and 4800 ISA and PCI adapters. If you have an ISA adapter, than make sure to configure DIP switches correctly.

Configuring DIP Switches (ISA Only)

The Aironet ISA adapter contains DIP switches for setting Plug and Play Mode (PnP), Base Address, and Interrupt Levels (IRQ). The switches are set for PnP mode by default.

Devices cannot share the same Base address or IRQ. Check the switch settings on the adapter to ensure the do not conflict with other devices in the computer.

PnP mode is controlled by the 6th switch:

6th DIP Switch	
On (Non-PnP)	Off (PnP)

If you set PnP mode on then all other settings are not taken into account. If you still want to use PnP mode make sure that the default IRQ and Base Address do not conflict with the other devices. The default are:

Base Address	IRQ Level
140	5

If you want to configure other IRQ and Base Address values, make sure PnP mode is turned off, i.e. 6th switch is On.

4.9-1 Managing Aironet 35/45/4800 Interfaces from Java

Aironet 35/45/4800 specific parameters can be controlled from "General", "RF Network," and "Advanced" tabs in interface details window. Current status (current signal quality, channel frequency, synchronization and association status, name of Access Point, and MAC address of Access Point) can be monitored in real time under the "Status" tab in interface details window.

4.9-2 Managing Aironet 35/45/4800 Interfaces from Console

Aironet 35/45/4800 interface management is done in the submenu "interface pc".

Command syntax	Description
print [<interface>]	Show interface(s) information
set <interface> [up] [down] [name <new name>] [mtu <MTU>] [type <ad-hoc|infrastructure>] [rtsthres <RTSthres>] [fragthres <fragthres>] [txpower <power>] [rxdiv <default|both|left|right>] [txdiv <default|both|left|right>] [longretr <longretr>] [shortretr <shortretr>] [channel <channel>] [rate <rate>] [ap1 <AP1>] [ap2 <AP2>] [ap3 <AP3>] [ap1 <AP4>] [ssid1 <ssid1>] [ssid2 <ssid2>] [ssid3 <ssid3>] [modulation <CCK|MBOK|default>] [clientname <client name>] [bperiod <bperiod>]	Change interface properties
monitor <interface>	Monitor interface status in real time

Where <interface> is interface name or number obtained from "print" command.

Interface status includes current signal quality, channel frequency, synchronization, association, name of Access Point, and MAC address of Access Point.

4.9-3 Aironet 35/45/4800 Interface Parameters

Name in console	Name in Java	Description
type	Infrastructure Mode	Operation mode of card (ad hoc or infrastructure). Default value is "infrastructure"
rtsthres	RTS threshold	RTS Threshold
fragthres	Fragmentation threshold	Fragmentation threshold
power	Transmit Power	Transmit power
rxdiv	Receive Antenna	Receive diversity
txdiv	Transmit Antenna	Transmit diversity
longretr	Long Retries	Long retry limit
shortretr	Short Retries	Short retry limit
channel	Channel	Channel frequency
rate	Data Rate	Data rate
ap1	Access Point 1	Access Point 1 (MAC Address)
ap2	Access Point 1	Access Point 2 (MAC Address)
ap3	Access Point 1	Access Point 3 (MAC Address)
ap4	Access Point 1	Access Point 4 (MAC Address)
ssid1	SSID1	Service Set Identifier 1
ssid2	SSID2	Service Set Identifier 2
ssid3	SSID3	Service Set Identifier 3
modulation	Modulation	Modulation mode
clientname	Client name	Client name
bperiod	Beacon period	Beacon period

Read the User Guide for details how to connect to the Access Point.

4.10 WaveLAN Interfaces Base Configuration

WaveLAN interfaces support 802.11 standard, i.e. it works with Aironet access points and works at 11Mbps rate. Tx power: 35 mW.

This interfaces needs the same license, as for Aironet 4800 interfaces. The driver is loaded automatically, when you boot up the router with the PCMCIA WaveLAN Network Adapter.

4.10-1 Managing WaveLAN Interfaces from Console

WaveLAN interface management is done in the submenu "`interface wavelan`".

Command syntax	Description
`print [<interface>]`	Show interface(s) information

`set <interface> [up] [down]`
`[nick <new nickname>] [mtu <MTU>]`
`[mode <ad-hoc|infrastructure>]`
`[rts <RTSthres>]`
`[frag <fragthres>]`
`[txpower <power>]`
`[freq <frequency>]`
`[rate <rate>]`
`[essid <essid>]`
	Change interface properties

`export`	
`blink`	
`monitor <interface>`	Monitor interface status in real time

Where `<interface>` is interface name or number obtained from "`print`" command.

4.10-2 WaveLAN Interface Parameters

Name in console	Name in Java	Description
`mode`	Infrastructure Mode	Operation mode of card (ad hoc or infrastructure). Default value is "infrastructure"
`rts`	RTS threshold	RTS Threshold. Value can be from 0 till 2347
`frag`	Fragmentation threshold	Fragmentation threshold. Values can be from 256 till 2346
`freq`	Frequency	Frequency for a network in Ad-Hoc mode.
`rate`	Data Rate	Data rate. Can be 1, 2, 5.5, 11 or auto.
`essid`	SSID	Network name. You should write in Access Point ssid. If not define, can connect to any AP
`nick`	Nickname	Card nickname

5 Bridge Configuration

Bridging is used to pass MAC layer packets between interfaces without any routing. When the routers are used in bridging mode, Spanning Tree Protocol is used to avoid bridging loops and to communicate information between routers/bridges. Bridging works only for Ethernet and RadioLan interfaces. You can bridge between Ethernet and RadioLan networks, only the router should be a default destination (on MAC level) for others clients of the radio network. Also you can bridge Ethernet networks through RadioLan network (point-to-point).

5-1 Configuring Bridge from Java

Select the Bridge menu. Various protocols can be enabled or disabled.

5-2 Configuring Bridge from Console

Bridge configuration commands are located in "`bridge`" menu.

Command syntax	Description
`Print`	Show bridge configuration
`set [bridge <on|off>] [ip <on|off>]` `[ipx <on|off>] [ipv6 <on|off>]` `[atalk <on|off>]`	Change bridge configuration

5-3 Bridge Configuration Parameters

Name in console	Name in Java	Description
`bridge`	Enabled	Enable/disable bridge
`ip`	IP	Enable/disable bridging of IP protocol
`ipx`	IPX	Enable/disable bridging of IPX protocol
`ipv6`	IPv6	Enable/disable bridging of IPv6 protocol
`atalk`	AppleTalk	Enable/disable bridging of AppleTalk protocol

6 Internet Protocol Management

The Internet Protocol Management section includes configuration of all IP level settings such as IP addresses, DHCP, static routes, and so on.

6.1 Addresses

Addresses serve as identification when communicating with other network devices. It is possible to add multiple IP addresses to each of the interfaces or to leave interfaces without addresses assigned to them.

6.1-1 Managing Addresses from Java

Select the IP/Addresses menu. The "Addresses List" list shows all IP addresses with basic settings. From the "Address List" window addresses can be edited, added, and removed. Some addresses (when using PPP) can appear and disappear dynamically. Dynamic addresses are marked with blue icon, others with yellow. Inactive addresses (their interfaces are disabled) are shown in gray and italic.

6.1-2 Managing Addresses from Console

Select "address" in the "ip" menu.

Command syntax	Description
add local <address> [prefix <prefix>] mask <mask> [broad <address>] interface <name>	Add new address
set <number> [local <address>] [prefix <prefix>] [mask <mask>] [broad <address>] [interface <name>]	Change address properties
remove <number>	Remove address
print	Show addresses
export	Export addresses

6.1-3 General Address Parameters

Name in Console	Name in Java	Description
interface	Interface	Name of interface the address will be used with
local	Local Address	Local IP address for the interface.
mask	Network Mask	Network Mask to be used with the prefix.
prefix	Prefix	(optional) Network Prefix to be used with the address. It shows what network can be reached through the interface with the given IP address. If not specified, will be calculated from Local Address and Network Mask.
broad	Broadcast Address	(optional) Broadcast Address to be used with the address. If not specified, will be calculated from Local Address and Network Mask.

6.2 Routes

Routes are needed for communicating with networks that are not directly attainable via the router's local interfaces. Routes to locally connected interfaces and networks are created automatically based on the IP address assigned to local interfaces. Static routes, including the default route, are set in the IP/Routes menu. Other automatic routes are created by routing daemons, such as RIP and OSPF, which can be found in the Routing menu from the base level. Dynamic routes are shown in IP/Routes, too.

6.2-1 Managing Routes from Java

Select the "Routes" menu under the "IP" menu. The "Routes List" shows current routes settings which can be edited, added, and deleted. Disabled routes (interface they are using is disabled) are shown in gray and italic. Dynamic routes are marked with blue icon, others with red.

6.2-2 Managing Routes from Console

Select th submenu "ip route".

Command syntax	Description
add interface <name> [gw <address>] [dst<address>] [mask <mask>]	Add new route

`[prefsrc <address>]`	
`set <number> [dst <address>]` `[mask <mask>] [gw <address>]` `[prefsrc <address>]` `[interface <name>]`	Change route properties
`Remove <number>`	Remove route
`print`	Show routes
`export`	Export routes

6.2-3 General Routes Parameters

Name in console	Name in Java	Description
`dst`	Dst. Address	Destination IP address of a host or network
`mask`	Netmask	Network Mask of the destination
`gw`	Gateway	Next gateway to the destination
`interface`	Interface	Interface to be used
`prefsrc`	Pref. Source	(optional) Source Address of packets leaving the router via this route

6.3 ARP

ARP (Address Resolution Protocol) displays IP addresses and respective MAC addresses of interfaces which are physically connected to local interface. The ARP table entries appear automatically as it sends broadcast messages to all interfaces physically connected to the local interfaces. It is possible to manually assign static ARP entries.

6.3-1 Managing ARP from Java

Select the 'ARP' menu under the 'IP' menu.   The 'ARP List' displays IP addresses, MAC addresses, and interface names and allows to edit, add, and remove ARP entries. Inactive entries are shown in gray color and italic font. Permanent entries are marked with red icon.

6.3-2 Managing ARP from Console

Select the located in "`address`" menu that is in the "`ip`" menu.

Command syntax	Description
`add interface <name>` `ip <address> mac <address>`	Add static ARP entry
`set <number>`	Change ARP entry

`[interface <name>]` `[ip <address>][mac <address>]`	
`remove <number>`	Remove ARP entry
`print`	Show ARP entries
`export`	Export ARP entries

6.3-3 General ARP Parameters

Name in console	Name in Java	Descripton
`ip`	IP Address	IP address
`mac`	Hardware Address	MAC address
`interface`	Interface	Interface name

6.4 PPP

Here you can setup PPP IP related settings: addresses, RADIUS and DNS which will be imparted to PPP clients.

6.4-1 Managing PPP from Java

Select the IP/Addresses menu. The "PPP IP Settings" list allows configuration of local address and remote address. To edit DNS and RADIUS server settings, select the details box located next to the refresh icon.

6.4-2 Managing PPP from Console

Management of PPP is done in the "`ip ppp`". The following commands can be executed there:

Command syntax	Description
`print`	Show interfaces
`dns`	PPP DNS settings menu
`radius`	PPP RADIUS settings menu

`set <interface>`
`[local <address>]`
`[remote <address>]`
	Change IP address settings

`export`	Export IP address settings

"`ip ppp dns`" menu commands:

Command syntax	Description
`export`	Export PPP DNS settings
`print`	Show PPP DNS settings
`set [primary <address>] [secondary <address>]`	Set primary and secondary Domain Name Servers

"`ip ppp radius`" menu commands:

Command syntax	Description
`export`	Export RADIUS settings
`print`	Show RADIUS settings
`set [radius no|off|on|yes] [server <address>] [secret <string>] [accounting no|off|on|yes]`	Change RADIUS settings

6.4-3 General PPP Parameters

Name in console	Name in Java	Description
`interface`	Interface	Interface name
`local`	Local Address	Local IP address
`remote`	Remote Address	Remote IP address
`primary`	Primary DNS Server	Primary DNS server address
`secondary`	Secondary DNS Server	Secondary DNS server address
`radius`	Use RADIUS	Enable/disable RADIUS server
`server`	RADIUS Server	RADIUS server address
`secret`	Shared Secret	Shared secret
`accounting`	RADIUS Accounting	Enable/disable RADIUS accounting

6.5 DHCP

DHCP is Dynamic Host Configuration Protocol. DHCP's purpose is to enable individual computers on an IP network to extract their configurations from a server (the 'DHCP server') or servers, in particular, servers that have no exact information about the individual computers until they request the information. The overall purpose of this is to reduce the work necessary to administer a large IP network.

6.5-1 Managing DHCP from Java

Select the "DHCP" menu under the "IP" menu.

6.5-2 Managing DHCP from Console

DHCP management can is controlled from the "dhcp" menu under the "ip" menu. The "dhcp" menu "lease" option shows all current DHCP leases.
"ip dhcp" menu commands:

Command syntax	Description
lease	DHCP leases menu
print	Show DHCP interfaces
export	Export DHCP settings
set <interface> [dhcp on|off] [from <address>] [to <address>] [lease <hh:mm:ss>] [srcaddr <address>] [mask <mask>][gateway <gateway>] [domain <name>] [dns <address>]	Set DHCP interface properties

"ip dhcp lease" menu commands:

Command syntax	Description
print	Show current DHCP leases

6.5-3 General DHCP Parameters

Name in console	Name in Java	Description
interface	Interface	Interface name
dhcp	Enabled	Enable/disable DHCP
from to	Address From To	The range of IP addresses that can be given to the clients.
lease	Lease Time	Time in hh:mm:ss the lease will be given out.
srcaddr	Src. Address	Source address of the router's DHCP interface to be used by the client when contacting the router.
mask	Netmask	Network mask to be used with the IP address.
gateway	Gateway	Default gateway to be used by the client.
domain	Domain Name	Domain name assigned to the client.

Name in console		Description
dns	DNS Server Address	DNS server address to be used by the client for address resolution.

Lease parameters (read only):

Name in console	Name in Java	Description
Interface	Interface	Interface name
IP address	IP Address	Client IP address
MAC address	Hw. Address	Client MAC address
Lease time	Lease Time	Lease time. Value should be hh:mm:ss, where hh is hours, mm is minutes and ss is seconds.

6.6 Firewall

Firewall supports filtering and security functions that are used to manage data flows to the router and through it. Along with the Network Address Translation they serve as security tools for preventing unauthorized access to networks.

Filtering rules organized together in chains do packet filtering. Each chain can be considered as a set of rules. There are three default chains, which cannot be deleted. More chains can be added for grouping together filtering rules. When processing a chain, rules are taken from the chain in the order they are listed from the top to the bottom.

Packets entering the router through one of the interfaces are first matched against the filtering rules of the Input chain. If the packet is not dropped or rejected, and it is for the router itself, the packet is delivered locally. If the packet is not dropped or rejected, but it has to be delivered outside the router, then the packet is processed according to the routing table. If the processing is successful, then the packet is matched to the filtering rules of the forward chain. After that, packet is passed to the output interface and processed according to the rules of output chain.

Packets originated from the router are processed according to the output chain only.

The firewall also has a packet "mark" feature which is used to mark packet flows for the standard queuing process and bandwidth allocation.

6.6-1 Managing Firewall Functions from Java

Select the "Firewall" menu under the "IP" menu. Select the corresponding tag to enter/edit desired information.

6.6-2 Managing Firewall Functions from Console

Firewall management can be performed from the "`ip firewall`" menu.

Command syntax	Description
`chain`	Firewall chains menu
`rule`	Firewall chain rules menu
`export`	Export firewall settings

"`ip firewall chain`" menu commands:

Command syntax	Description
`print`	Show all chains
`add [name <name>] [policy accept|deny|masquerade|reject]`	Add new chain
`set <chain name or number> [name <name>] [policy <policy>]`	Change chain
`remove <chain name or number>`	Remove chain

"`ip firewall rule`" menu commands:

Command syntax	Description

`add <chain>`
`[action accept|deny|jump|masq|none`
`|reject|return] [proto <protocol>]`
`[target <chain>]`
`[srcaddr <address>]`
`[srcmask <mask>]`
`[srcports <ports>]`
`[dstaddr <address>]`
`[dstmask <mask>]`
`[dstports <ports>]`
`[interface <name>]`
`[tcp all|nosys|sys]`
`[flow <mark>] [log on|off]`
	Add new rule

`set <chain> <rule number>`
`[action accept|deny|jump|masq|none`
`|reject|return] [proto <protocol>]`
`[target <chain>]`
	Change rule

`[srcaddr <address>]`
`[srcmask <mask>][srcports <ports>]`
`[dstaddr <address>]`
`[dstmask <mask>]`
`[dstports <ports>]`
`[interface <name>|all]`
`[tcp all|nosys|sys][flow <mark>]`
`[log on|off]`	

`remove <chain name or number>` `<rule number>`	Remove rule
`move <chain> <source> <destination>`	Move rule in this chain from source number to destination number
`print <chain name or number>`	Show rules

6.6-3 General Firewall Parameters

Rule parameters:

Name in console	Name in Java	Description
`action`	Action	Action to perform
`log`	Log	Turns on or off logs writing option.

`srcaddr`
`srcmask`
`srcports`
	Source
	Address
	Mask
	Port
		Source address, mask, and port of the packet.
		Default port 0 means all ports 1-65535. For ICMP packets, port parameter means ICMP packet type.

`dstaddr`
`dstmask`
`dstports`
	Destination
	Address
	Mask
	Port
		Destination address, mask, and port of the packet
		Default port 0 means all ports 1-65535. For ICMP packets, port parameter means ICMP packet code.

`proto`	Protocol	Protocol name of the packet: all, icmp, tcp, udp etc.
`interface`	Interface	Interface name or `all` for any interface
`tcp`	TCP Options	Can be specified only if tcp is selected.
`target`	Target Chain	Can be specified if action is 'jump'
`flow`	Flow Mark	Mark for the packet to be used in further actions (queuing). Flow mark is used only inside the router, and it is lost when the packet exits the router. If there are several rules for marking the packet, the packet is marked with the flow mark from the last applied rule.

Actions to perform on rules:

Action name in console	Action name in Java	Description
accept	Accept	Accept everything
reject	Reject	Reject everything and send ICMP reject message
deny	Deny	Silently drop the packet (without sending the ICMP reject message)
masq	Masq	Use masquerading
return	Return	Return to the chain from which this rule has been invoked
jump	Jump	Jump to another chain

Chain parameters:

Name in console	Name in Java	Description
name	Name	Chain name
policy	Policy	Chain policy

6.7 NAT

NAT (Network Address Translation) is the translation of an IP address used within one network to a different IP address known within another network. One network is designated the *inside* network and the other is the *outside*. Typically, an administrator maps the local inside network addresses to one or more global outside IP addresses and unmaps the global IP addresses on incoming packets back into local IP addresses. This helps ensure security since each outgoing or incoming request must go through a translation process that also offers the opportunity to qualify or authenticate the request or match it to a previous request. NAT also conserves the number of global IP addresses and it lets the whole network use a single IP address in its communication with the world.

6.7-1 Managing NAT from Java

Select the "NAT" menu under the "IP". The "NAT" list allows editing, adding, and removing NAT entries.

6.7-2 Managing NAT from Console

Network Address Translation management is performed in the "`ip nat`" menu.

Command syntax	Description
`print`	Show NAT rules
`export`	Export NAT rules
`move <source number>` `<destination number>`	Move NAT rule from source number to destination number
`remove <rule number>`	Remove NAT rule
`add [interface <name>] [scr <address>]` `[smask <mask>] [dst <address>]` `[dmask <mask>] [rotocol <protocol>]` `[spots <port range>]` `[dports <port range>]` `[nat-src <address>]` `[nat-dst <address>] [nat-smask <mask>]` `[nat-dmask <mask>] [nat-sport <potr>]` `[nat-dport <port>] [translate on|off]` `[direction in|out]`	Add NAT rule
`set <number> [interface <name>]` `[scr <address>] [smask <mask>]` `[dst <address>] [dmask <mask>]` `[rotocol <protocol>]` `[spots <port range>]` `[dports <port range>][nat-src address>]` `[nat-dst <address>] [nat-smask <mask>]` `[nat-dmask <mask>] [nat-sport <potr>]` `[nat-dport <port>] [translate on|off]` `[direction in|out]`	Change NAT rule

6.7-3 General NAT Parameters

Name in console	Name in Java	Description
`direction` `in|out`	Direction	The direction of the packet, where `in` means from the interface into the router, and `out` means from the router to the interface.
`src` `smask` `sports`	Source Addr: Mask: Port:	Source address, mask, and port of the packet (default port 0 means all ports 1-65535)
`dst` `dmask` `dports`	Destination Addr: Mask:	Destination address, mask, and port of the packet (default port 0 means all ports 1-65535)

	Port:	
`interface`	Interface	Name of the interface the packet is passing through
`protocol`	Protocol	Protocol name of the packet: all, icmp, tcp, etc.
`translate`	Translate	Designates the action to perform on packet – translate or leave unchanged
`nat-src` `nat-smask` `nat-sport`	Source Addr: Mask: Port:	New source address, mask, and port of the packet (port 0 and address 0.0.0.0 mean: leave unchanged)
`nat-dst` `nat-dmask` `nat-dport`	Destination Addr: Mask: Port:	New destination address, mask, and port of the packet (port 0 and address 0.0.0.0 mean: leave unchanged)

6.8 DNS

By using a DNS server, router administrators can use hostnames instead of IP addresses when setting up routes, filters, and other places where a numbered IP address is not required.

6.8-1 Managing DNS from Java

Select the "DNS" menu under the "IP" menu. The "DNS" box can be configured with the primary DNS and secondary DNS by selecting the DNS settings icon.

6.8-2 Managing DNS from Console

"`ip dns`" menu commands:

Command syntax	Description
`export`	Export DNS configuration and entries
`static`	Static DNS entries management menu
`set [primary <address>] [secondary <address>]`	Change DNS settings
`print`	Show DNS settings

"`ip dns static`" menu commands:

Command syntax	Description
`print`	Show static DNS entries
`export`	Export static DNS entries
`add name <hostname>` `address <address>`	Add static DNS entry
`remove <entry number>`	Remove static DNS entry

`set <number>`
`[name <hostname>]`
`[address <address>]`
	Change static DNS entry

6.8-3 General DNS Parameters

Name in console	Name in Java	Description
`name`	Name	Host name
`address`	IP Address	Host IP address
`primary`	Primary DNS Server	Primary DNS server address
`secondary`	Secondary DNS Server	Secondary DNS server address

7 SNMP Service Configuration

The *MikroTik* router currently supports a limited implementation of the SNMP protocol. Currently SNMP can only be used to remotely monitor the network and collect statistics. The current *MikroTik* SNMP agent provides information about traffic on network interfaces and system information (name, location, contact, routes, addresses, interfaces, ARPs, and TCP connections). *MikroTik* router has <u>only one</u> community (others are not supported) of the type "public" and it is read-only. I.e. the router cannot be configured using SNMP management programs. It is possible only to set location and contact information parameters from the Console or the Java Console.

7-1 Configuring SNMP from Java

Select the SNMP menu to enabled or disabled and set SNMP service information.

7-2 Configuring SNMP from Console

SNMP configuration commands are located in "`routing/snmp`" menu. It contains following commands:

Command syntax	Description
`print`	Show SNMP service configuration

`set [status <on|off>]`
`[location <router location>]`
`[contact <contact information>]`
	Change SNMP service configuration

7-3 SNMP Configuration Parameters

Name in console	Name in Java	Description
`status`	Enabled	Enable/disable SNMP service
`location`	Location	Router location. Maximum 255 characters
`contact`	Contact Info	Administrator contact information. Maximum 255 characters

8 Queues Management

Queuing is a mechanism that controls bandwidth allocation, delay variability, timely delivery, and delivery reliability.

8-1 Managing Queuing from Java

Open the "Queues" window by clicking on the corresponding menu. New queues are automatically added when an interface is inserted and set up. When a queue is set to type "split", new sub-node queues can be added. Each new queue can be set to queuing type (or algorithm).

8-2 Managing Queuing from Console

Not supported.

Command syntax	Description

8-3 General Queuing Parameters

Queue parameters:

Name in Console	Parameter	Description
	Queue type	Available queue types
	Flow mark	Flow mark of the stream (sorting parameter). See *Firewall* section.
	Limited at	Maximum bandwidth for the stream
	Priority	Flow priority (1..15)
	Weight	Flow weight
	Allocated	The number of bytes allocated for the bandwidth
	Isolated	Other queues wont be able take over this queue bandwidth
	Bounded	The queue can occupy other queues if its necessary

Queue type	Characteristics
PFIFO	Packet First-In First-Out – is the simplest queuing algorithm. The packets are served in the same order as they are received
BFIFO	The same as PFIFO, except that this algorithm is byte-based but not packet-based
RED	Random Early Detection – an algorithm for congestion avoidance in packet-switched networks
Split	This type allows the packets to be sorted by flow mark and specify the parameters for each such sub-node separately. Each sub-node can be of type PFIFO or BFIFO. It cannot be split further

RED queue parameters:

Name in console	Name in Java	Description
	Queue Type	Queue type
	Bandwidth	Queue bandwidth (in bytes/sec)
	Min Threshold	Before this value is achieved no packets will be thrown away
	Max Threshold	When this value is achieved the queue will throw away the packets using maximum probability, where this probability is a function of the average queue size[1].
	Queue Size	Queue size in bytes
	Burst	Number of packets allowed for an occasional bursts of packets in the queue

PFIFO queue parameters:

Name in console	Name in Java	Description
	Queue Type	Queue type
	Bandwidth	Queue bandwidth (in bytes/sec)
	Queue Size (in packets)	Maximum packet number that queue can hold

---

[1] If probability is denoted by **p** then consider the following: **min <= p <= max**, where **min** is **p** when *average queue size = minimum queue size* **(p=0%)** and **min** is **p**, when *average queue size = maximum queue size* **(p=2%)**.

BFIFO queue parameters:

Name in console	Name in Java	Description
	Queue Type	Queue type
	Bandwidth	Queue bandwidth (in bytes/sec)
	Queue Size (in bytes)	Maximum byte number that queue can hold

9 Advanced Routing Management

Standard kernel routes are created when adding an address to the router and static routes are added by the user. A third type of route is created by software daemons such GateD routing. For exchanging the routing information between the routers, MikroTik™ Router Software supports two interior routing protocols: the Routing Information Protocol (RIP) [Version 1 and Version 2] and the Open Shortest Path First (OSPF) protocol.

9.1 Routing Information Protocol

RIP selects the route with the lowest metric as the best route. The metric is a hop count representing the number of gateways through which data must pass through to reach its destination. To enable the exchange of routing information between two routers connected to the same network both routers should have RIP enabled on the interfaces to the network which connects them. Only information about kernel routes and routes learned using RIP is exchanged between the routers.

9.1-1 Managing RIP from Java

Select the "Routing" menu and the "RIP" menu. Select the icon of the desired interface to change its RIP settings.

9.1-2 Managing RIP from Console

Go to the "`routing`" menu by executing the command with the corresponding name from the base level. Then go to the "`rip`" menu.

Command syntax	Description
`print`	Show RIP settings
`export`	Export RIP settings

`set <interface>`
`[in none|rip1-2]`
`[out none|rip1|rip1-`
`comp|rip2]`
`[auth MD5|none|simple]`
`[metric <value>]`
`[passwd <passwd>]`
	Change RIP settings

9.1-3 General RIP Parameters

Name in console	Name in Java	Description
interface	Interface	Interface name
in	In	Incoming RIP mode
out	Out	Outgoing RIP mode
auth	Authentication	Authentication mode
passwd	Password	Password string
metric	Metric	Metric used both outgoing and incoming routes (this metric is added to existing metric of route). Positive numbers greater than 0.

9.2 Open Shortest Path First

OSPF is a shortest path first or link-state protocol. OSPF is an interior gateway protocol that distributes routing information between routers in a single autonomous system. OSPF chooses the least cost path as the best path. OSPF is better suited than RIP for complex networks with many routers. OSPF provides equal cost multipath routing where packets to a single destination can be sent via more than one interface simultaneously.

9.2-1 Managing OSPF from Java

Select the "Routing" menu and then the "OSPF" menu. Four tabs can be used for configuration: "Interfaces", "Areas", "Stub Hosts," and "Virtual Links".

9.2-2 Managing OSPF from Console

Go to the "routing ospf" menu.

Command syntax	Description
interface	OSPF interfaces menu
area	OSPF areas menu
shost	OSPF stub hosts menu
vlink	OSPF virtual links menu
set routerid <address>	Change router ID (if this value is not set than the router will choose any of assigned IP addresses)
print	Show router ID
export	Export OSPF settings

OSPF interfaces menu commands:

Command syntax	Description
print [detail]	Show OSPF interfaces (you can use detailed form)
export [<filename> append]	Export OSPF interface settings (You can export in a file or append to an existing file)
set <interface> [up] [down] [area <name>] [cost <value>] [prio <value>] [passwd <password>] [retr <value>] [delay <value>] [hello <value>] [dead <value>]	Change OSPF interface settings

OSPF areas menu commands:

Command syntax	Description
print	Show OSPF areas
export [<filename> append]	Export OSPF areas
set <area> [name <name>] [cost <value>] [auth none|simple] [stub on|off]	Change OSPF areas
add name <name> id <address> [cost <value>] [auth none|simple>] [stub on|off]	Add new OSPF area
remove <area name or number>	Remove area

OSPF stub hosts menu commands:

Command syntax	Description
print	Show OSPF hosts
export [<filename> append]	Export OSPF hosts
set <host> [area <name>] [cost <value>] [host <address>]	Change stub host properties
add area <name> cost <value> host <address>	Add stub host
remove <host number>	Remove stub host

OSPF virtual links menu commands:

Command syntax	Description
`print [detail]`	Show virtual links (you can do it in detailed form)
`export [<filename> append]`	Export OSPF virtual links
`set`	Change virtual link properties

`add area <name>`
`neighbor <address>`
`[prio <value>]`
`[passwd <password>]`
`[retr <value>]`
`[delay <value>]`
`[hello <value>]`
`[dead <value>]`
	Add virtual link

`remove <link number>`	Remove virtual link

9.2-3 General OSPF Parameters

Interfaces parameters:

Name in console	Name in Java	Description
`interface`	Interface	Interface name
`area`	Area	Area
`up` `down`	Enabled	Enable/Disable OSPF
`cost`	Cost	Cost. Positive number greater than 0
`prio`	Priority	Priority. Number from 0 till 255
`passwd`	Password	Password
`retr`	Retransmit Interval	Retransmit Interval. Greater than 0. Default value is 5.
`delay`	Transit Delay	Transit Delay. Greater than 0. Default value is 1.
`hello`	Hello Interval	Hello Interval. Greater than 0. Default value is 10.
`dead`	Router Dead Interval	Router dead interval. If the router doesn't receive an answer from the neighbor router during that time it will regard it as not functioning. Greater than 0. Default value is 40.

Areas parameters:

Name in console	Name in Java	Description
name	Area name	Area name
id	Area ID	Area ID
stub	Stub Area	Area that has only one link outside
cost	Cost	Cost. Positive number greater than 0
auth	Authentication	Authentication mode

Stub hosts parameters:

Name in console	Name in Java	Description
host	Host	Host address
area	Area	Area
cost	Cost	Cost. Positive number greater than 0

Virtual links parameters:

Name in console	Name in Java	Description
neighbor	Neighbor ID	The other end router ID
area	Transit Area	Transit Area
prio	Priority	Priority. Values from 0 till 255.
passwd	Password	Password
retr	Retransmit Interval	Retransmit Interval. Greater than 0. Default value is 5.
delay	Transit Delay	Transit Delay. Greater than 0. Default value is 1.
hello	Hello Interval	Hello Interval. Greater than 0. Default value is 10.
dead	Router Dead Interval	Router dead interval. If the router doesn't receive an answer from the neighbor router during that time it will regard it as not functioning. Greater than 0. Default value is 40.

10 System Configuration

10.1 Terminal Setup and Basic System Setup

10.1-1 Basic System Setup

This action can be performed only in the console. The described below commands can be executed from the base level or from anywhere else if you type "/" before them.

10.1-2 Basic Router Setup

Basic router setup can be done from the base level using setup command.

If you have an NE2000 Ethernet card then it was loaded automatically on boot all you have to do is to enable this interface and make all necessary IP settings. You can do that using the `setup` command:

Command	Parameters	Description
setup		Basic system setup
	Enable interface	Enable an interface
	IP Address	Set router's IP address
	Netmask	Set network mask
	Gateway	Set a default gateway of the router

Try to ping some host on your network to test the initial configuration, for example:

```
[MikroTik]> ping 1.1.1.2
```

If you get responses from the host, your network connection works properly, and you should be able to access the router remotely via network.

If you have some other network card please read the "Device Driver Management" section in the User Manual for details on a specific driver you are using, whether it is loaded automatically or not. If it was loaded automatically then the `setup` command would work as described above.

If the driver was not loaded automatically then the `setup` command will ask you to do that. Also you will be prompted to enter IP parameters:

Command	Parameters	Description
`setup`		Basic system setup
	`Load driver`	Load network device driver. You can choose one of the following: `arlan, moxa, ne2k-isa, pc-isa, radiolan`
	`driver io`	Set input/output port range base address. Can be omitted if device does not use IO ports
	`driver irq`	Set Interrupt Request Number. Can be omitted if device does not use IRQ. For IRQ probing enter 0
	`IP Address`	Set router's IP address
	`Netmask`	Set network mask
	`Gateway`	Set a default gateway of the router

Use ping command as described above to check your settings.

10.1-3 Set Terminal Type

Command syntax	Description
`set [ansi	linux	rxvt-m	vt100	vt220	xterm	dumb	rxvt	sun	vt102 vt52]`	Set terminal type
`print`	Show current terminal type
`reset`	Reset previous terminal type

10.2 Packages

Packages are used to upgrade the router or add features.   Packages should be obtained from the Mikrotik website. Packages can be FTPed to the router only by user "root". After rebooting the router, the packages will be installed.

10.2-1 Viewing Packages from Java

Select the "System" menu and then the "Packages" menu. Name, version, and build numbers of the installed packages are shown under the "Installed" tab. Name, version, and upload time are shown of the uploaded packages under the "Uploaded" tab.

10.2-2 Viewing Packages from Console

In the console installed and uploaded packages information can be viewed in the "sys package" menu by executing the following command:

Command syntax	Description
installed	Installed packages menu
uploaded	Uploaded packages menu

"sys package installed" menu commands:

Command syntax	Description
set <number> [uninstall no|off|yes|on]	Uninstall package
print	Show installed packages

"sys package uploaded" menu commands:

Command syntax	Description
remove <number>	Remove an uploaded package
print	Show uploaded packages

10.2-3 Packages Parameters

Installed packages parameters:

Name in console	Name in Java	Description
name	Name	Name of the package
version	Version	Version number of the package
build	Build Number	Build Number
uninstall	Uninstall	Will uninstall after next reboot

Uploaded packages parameters:

Name in console	Name in Java	Description
name	Name	Name of the package
version	Version	Version number of the package
build	Build Number	Build Number

10.3 System History

The system keeps a history of the configuration changes since last boot. The history is lost when the router is rebooted. The 'history' buttons on the Java panel allow the user to 'undo' and 'redo' actions.

10.3-1 Viewing System History from Java

Select the "History" menu. The system history can be viewed in the appeared "History" window. The information is read only. Use the buttons on the main widow to 'undo' and 'redo' actions.

10.3-2 Viewing System History from Console

The system history can be viewed from the "`sys history`" menu.

Command syntax	Description
`print`	Show command history

10.3-3 System History Parameters

Name in console	Name in Java	Description
`description`	History	System history
`level`	Access Level	Shows what privileges user privileges are needed to undo the changes

10.4 User Management

User management includes adding users, removing users, setting names, groups, and passwords.

10.4-1 User Management from Java

User management can be performed from the "Users List" windows that appears after you select the "Users" menu in the "Sys" menu.

10.4-2 User Management from Console

Go to the "`sys user`" menu.

Command syntax	Description

`add name <name>`
`password <password>`
`group full|ppp|read|write`
`[ppp on|off]`
`[desc <description>]`
`[server <name>]`
`[addr <address>]`
	Add new user

`set <user number>`
`[name <name>]`
`[desc <description>]`
`[ppp on|off>]`
`[group full|ppp|read|write>]`
`[password <password>]`
`[addr <address>]`
`[server <name>]`
	Change user properties

`remove <user number>`	Remove user
`print`	Show user(s)
`export`	Export PPP users

10.4-3 User Parameters

Name in console	Name in Java	Description
`name`	Name	Login name - this value cannot be changed for existing users. Can contain letters, digits, "*" and "_"
`group`	Group	Indicates the access group the user belongs to. See the table below for available values
`desc`	Description	Description for the user
`password`	Password	List box used to change the password for current user. It conforms to standard Unix characteristics of passwords. Can contain letters, digits, "*" and "_"
	Confirm	For password confirmation
`ppp`	Allow to use PPP	Enable to allow dial in use or use the user name and password for authentication at the remote host when dialing out
`server`	Server Name	Authentication Server Name (empty field means any server name) for the PPP-

		users
`addr`	Preferred IP Address	IP address to be assigned to the user's dial-in client when logged in using PPP. If the remote address is specified in PPP interface settings then this address should match the specified address in order to enable client to log in

Note: user "*" will be used for PPP as any user

Groups parameters:

Group name in console	Group name in Java	Description
`ppp`	PPP	Designed for PPP accounts. Provides only PPP access to the router
`read`	Read	Can only view the configuration, but not change it
`write`	Write	The same as "Full", but without permission to add, delete, or change users
`full`	Full	Full control

10.5 Change Password

You can easily change password using this special command.

10.5-1 How To Change Password Using Java

In the main menu there is an item "Password". You will be prompted to enter your old password and enter new password twice. When you logout and login for the next time, you must enter the new password. The old password is lost forever.

10.5-2 How To Change Password Using Console

Go to the base level and execute the following command:

Command syntax	Description
`password`	Change user password.

You will be prompted to enter your old password and enter new password twice. When you logout and login for the next time, you must enter the new password. The old password is lost forever.

10.6 System Resources

System's uptime, total memory, HDD/Flash drive size, CPU type, and CPU frequency are displayed.

10.6-1 Viewing System Resources from Java

Select the "System" menu and the "Resources" menu. Java gives you expanded possibilities in viewing the system resources. Under the 'Monitor' tab a window shows the utilization of system's CPU and memory usage in graphical form. Under the 'IRQ' tab, the system's hardware IRQ's and their usage are shown. Under 'IO' tab, the system's IO memory ranges used by various devices are shown.

10.6-2 Viewing System Resources from Console

In the console, system resources can be viewed in the " `sys resource` " menu. There are three submenu there.

Command syntax	Description
info	General system information
io	I/O port range information
irq	Interrupt request information

Submenu commands:

Submenu	Command	Description
info	print	Show system information
io	print	Show I/O port information
irq	print	Show IRQ information

10.6-3 System Resources Parameters

General parameters:

Name in console	Name in Java	Description
uptime	Uptime	Time passed from the last restart
total memory	Total Memory	RAM the router is using

cpu type	CPU	Central Processing Unit type
cpu freq	CPU Frequency	Central Processing Unit frequency
hdd size		Hard Disk Drive capacity
hdd free		Hard Disk Drive free

IRQ parameters:

Name in console	Name in Java	Description
#	IRQ Number	IRQ Line Number (from 0 to 15)
State	Used	Used (yes or no)
Owner	Name	Owning device name

I/O parameters:

Name in console	Name in Java	Description
range	Used IO Memory Ranges	Memory addresses that a device can use to send or receive data
owner	Name	Owning device name

10.7 System Shutdown

System shutdown (halt), reboot, and reset controls. For most systems, it is necessary to wait approximately 30 seconds for a safe power down.

10.7-1 System Shutdown from Java

Select the "System" menu then the "Shutdown" menu. The dialog box will appear asking you whether you want to reboot or shutdown the router. Warning: after entering 'shutdown,' it is necessary to manually restart the router.

10.7-2 System Shutdown from Console

The following commands can be executed in the " sys" menu:

Command syntax	Description
reboot [-f]	Reboot the system. Use -f argument to suppress confirmation
reset	Reset the system. **Note: This command deletes all router configuration settings!!!!! New ID/PWD are root/root**
halt [-f]	Halt the system. Use -f argument to suppress confirmation

10.8 System Identity

Set the identification name of the router.

10.8-1 Setting System Identity from Java

Select "System" menu and then "Identity" and enter the router name.

10.8-2 Setting System Identity from Console

Go to the "sys" menu.

Command syntax	Description
identity set <name>	Set system identity

10.8-3 System Identity Parameters

Name in console	Name in Java	Description
<name>	Router Name	System identity string is used as human friendly name for router and also in SNMP queries. Maximum is 16 characters.

10.9 System Date and Time

View and change the system date and time settings.

10.9-1 Setting Date and Time from Java

Select the "System" menu and the "Date & Time" menu. Changes will be discarded when the router is restarted.

10.9-2 Setting Date and Time from Console

In the system console date and time settings can be change in two different menus. These commands can be executed from the "sys date" menu:

Command syntax	Description
set time [HH:MM:SS]	Set system time
set date	Set system date

`[month/DD/YYYY]`	
`print`	Shows current date and time

Date and time settings become permanent and effect BIOS settings.

10.9-3 Date and Time Parameters

Date parameters:

Parameter name	Description
`month`	Month should be entered using three first letters of its name
`day`	Day of a month
`year`	Year should be entered using all four digits

Time parameters:

Parameter name	Description
`hours`	Hours
`minutes`	Minutes
`seconds`	Seconds

10.10 System Logs Management

Various system events and status information can be logged. Logs can be saved in a file on the router or sent to a remote server running a syslog daemon. Mikrotik provides a shareware Windows syslog daemon at www.mikrotik.com.

10.10-1 Managing System Logs from Java

Click on the "System" menu. If you want to view all system logs then go to the "Logs" menu. For configuring logs select the "Log Manager" menu. Select the "Log Default Settings" icon to set number of buffer lines, default IP address, and default port. To configure log sources select the icon of the corresponding line.

10.10-2 Managing System Logs from Console

Local logs can be viewed in the " `sys logs` " menu:

Command syntax	Description
`print`	Display local log buffer

Global logging management is performed in the "`sys logger`" menu.

"`sys logger`" menu commands:

Command syntax	Description
`print`	Show global logging configuration

`set [address <address>]`
`[port <number>]`
`[lines <number>]`
	Change global logging configuration

`sources/`	Log sources configuration menu

"`sources`" submenu commands:

Command syntax	Description
`print`	Show configuration of log sources

`set <number>`
`[type local|none|remote]`
`[address <address>]`
`[port <number>]`
`[prefix <prefix>]`
`[interval <interval>]`
	Change configuration of log sources

10.10-3   System Logs Parameters

Log sources configuration parameters:

Name in console	Name in Java	Description
`group`	Group	(Read-only) Name of the log group
`type`	Logging	Type of logging.
`prefix`	Prefix	Local log prefix is used when local logging is enabled. Each line coming from this source is preceded by a prefix
`address`	Remote Address	Remote log server IP address. Used when logging type is remote. If not set, default log server IP address is used
`port`	Remote Port	Remote log server UDP port. Used when logging type is remote. If not set, default log server UDP port is used
`interval`	Interval	Traffic logs dump interval. Used only for Traffic-Account source. Tells how often traffic logs should be dumped

Types of logging:

Type	Description
local	When type "local" is used, logs are stored in local log buffer
none	When type "none" is used, logs from this source are discarded
remote	When type "remote" is used, logs are sent to remote log server

Global logging parameters:

Name in console	Name in Java	Description
lines	Number of Buffer Lines	Number of lines kept in local buffer. When number of lines in local log buffer is exceeded, lines from the beginning of buffer are deleted.
address	Default IP Address	Remote log server IP address. Used when remote logging is enabled but no IP address of the remote server is specified (IP=0.0.0.0)
port	Default Remote Port	Remote log server UDP port. Used when remote logging is enabled but no UDP port of the remote server is specified (UDP=0)

10.11 License

You can view and set Software ID Number by executing command " license" in the "sys" menu in console.

Command syntax	Description
set <key>	Set software key
print	Show software ID number

11 Tools

MikroTik tools include standard TCP/IP tools such as ping and trace-route and also custom made tools. *MikroTik* custom tools are designed to assist you in verifying the quality of links – stability and bandwidth. If you have any suggestion for improving these tools, please suggest it at our suggestion page on our website.

11.1   Ping

Ping uses Internet Control Message Protocol (ICMP) Echo messages to determine if a remote host is active or inactive and to determine the round-trip delay when communicating with it.

11.1-1 Launching Ping Utility from Java

Select the "Ping" submenu in the "Tools" menu. The Ping utility sends four ping messages and displays them in real time in the Ping list box.

11.1-2 Launching Ping Utility from Console

From local console enter the command `ping` from the base level or us `/ping` from any location in the console.

Command syntax	Description
`ping <address> [psize <packet size>] [interval <interval>]`	Send ICMP Requests

Ping utility shows Time To Live value of the received packet (ttl) and Roundtrip time (time) in ms.

The console Ping session may be stopped when the `Ctrl + C` is pressed.

11.1-3 Ping Utility Parameter Description

Name in console	Name in Java	Description
`<address>`	Address	IP address for the host you want to ping.
`psize`	Packet Size	(optional) Size of each ICMP packet (in bytes).
`interval`	Interval	(optional) Delay between messages (in seconds). Default is 1 second.

11.2 Traceroute

Traceroute is a TCP/IP protocol-based utility, which allows the user to determine how packets are being routed to a particular host. Traceroute works by increasing the time-to-live value of packets and seeing how far they get until they reach the given destination; thus, a lengthening trail of hosts passed through is built up.

11.2-1 Launching Traceroute Utility from Java

Select the "Traceroute" window in the "Tools" menu. When the trace is complete, the output indicates total number of hops to the host and corresponding TTL values per hop.

11.2-2 Launching Traceroute Utility from Console

Execute the command `traceroute` from the base level:

Command syntax	Description
`traceroute <address> [timeout <timeout>]` `[psize <psize>]`	Trace route to a host

Traceroute shows the number of hops to the given host address of every passed gateway. Traceroute utility sends packets three times to each passed gateway so it shows three timeout values for each gateway in ms.

11.2-3 General Traceroute Utility Parameters

Name in console	Name in Java	Description
`<address>`	Trace To	IP address of the host you are tracing route to.
`timeout`	Timeout	(optional) Response waiting timeout, i.e. delay between messages (10..1500, default 64).
`psize`	Packet Size	(optional) Packet size in bytes (1..5, default is 1).

11.3 Bandwidth Test

The Bandwidth Tester can be used to monitor the throughput to a remote *Mikrotik* router (either wired or wireless) and thereby help to discover network 'bottlenecks'.

The TCP test uses the standard TCP protocol with acknowledgments and follows the TCP algorithm on how many packets to send according to latency,

dropped packets, and other features in the TCP algorithm.   Please review the TCP protocol for details on its internal speed settings and how to analyze its behavior. Statistic for throughput are calculated using the entire size of the TCP packet. As acknowledgments are an internal working of TCP, their size and usage of the link are not included in the throughput statistics. Therefore this statistic is not as reliable as the UDP statistic when estimating throughput.

The UDP tester sends 110% or more packets than currently reported as received on the other side of the link. To see the maximum throughput of a link, the packet size should be set for the maximum MTU allowed by the links – usually this is 1500 bytes. There is no acknowledgment required by UDP, this implementation means that the closest approximation of the throughput can be seen.

11.3-1 Test Bandwidth from Java

Select the "Bandwidth" submenu of the "Tools" menu. Designate the IP address of the host to test and choose the test mode (either TCP or UDP).

For UDP, choose the desired Packet Size in the corresponding edit box. The test output is represented as two graphs showing current speed and the ten-second average.

11.3-2 Test Bandwidth from Console

Use the `btest` command from the base level.

Command syntax	Description
`btest <address> [type <type>]` `psize <psize>]`	Run bandwidth test to a remote Mikrotik router

Example:
```
[P46]> btest 10.0.0.56 type udp psize 50
Bandwidth test to 159.148.172.206, protocol UDP, packet
size 50
```
To stop bandwidth test use `CTRL + C`.

11.3-3 Bandwidth Test Parameters

Name in console	Name in Java	Description
`<address>`	Test link to	IP address of destination host
`type`	TCP / UDP	Test type can be `UDP` or `TCP`
`psize`	Packet Size (UDP only)	Packet size (50 to 1500 bytes)

11.4 Ping Flood

Ping flood sends ICMP (Internet Control Message Protocol) echo requests to a remote host in the same manner as the ping utility but it sends the next request as soon as it receives a reply.

11.4-1 Launching Ping Flood from Java

Select the "Flood Ping" submenu in "Tools" menu. Flood ping shows sent packets percentage (from the given number), received packages percentage, minimum, average and maximal Roundtrip Time of the packages.

11.4-2 Launching Ping Flood from Console

Command `floodping` should be executed from the base level with the following parameters:

Command syntax	Description
floodping <address> [psize <size>] [timeout <time>] [total <number>]	Launch flood ping

11.4-3 Ping Flood Utility Parameters:

Name in console	Name in Java	Description
<address>	Ping to	IP address of destination host
psize	Packet Size	Size of each ICMP packet (in bytes)
total	Number of Packets	Number of ICMP packets
timeout	Timeout	Time after which in the packet is considered lost in case of no response (in ms)